

[54] TUNGSTEN SILICIDE (WSi_x) DEPOSITION PROCESS FOR SEMICONDUCTOR MANUFACTURE

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[58] Field of Search 437/200, 190; 148/DIG. 147, DIG. 27, DIG. 19

[56] References Cited

U.S. PATENT DOCUMENTS

4,684,542 8/1987 Jasinski et al. 437/245
4,851,295 7/1989 Brors 437/200
4,902,645 2/1990 Ohba 148/DIG. 19
4,966,869 10/1990 Hillman et al. 437/200

FOREIGN PATENT DOCUMENTS

0720419 5/1988 Japan 148/DIG. 19
0066173 3/1990 Japan .

OTHER PUBLICATIONS

Properties of WSi_x using dichlorosilane in a single-wax

system, T. H. Tom Wu, Richard S. Rosler, Bruce C. Lamartine, Richard B. Gregory, and Harland G. Tompkins; accepted Jul. 14, 1988; American Vacuum Society 1988.

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[57] ABSTRACT

A semiconductor manufacturing process for depositing a tungsten silicide film on a substrate includes deposition of a tungsten silicide nucleation layer on the substrate using a (CVD) process with a silane source gas followed by deposition of the tungsten silicide film with a dichlorosilane source gas. This two step process allows dichlorosilane to be used as a silicon source gas for depositing a tungsten silicide film at a lower temperature than would otherwise be possible and without plasma enhancement. Tungsten silicide films deposited by this process are characterized by low impurities, good step coverage, and low stress with the silicon substrate.

15 Claims, 1 Drawing Sheet

DEPOSITING A NUCLEATION LAYER OF TUNGSTEN SILICIDE (WSi_x) ON A SUBSTRATE USING A (CVD) PROCESS WITH SILANE (SiH₄) AS A SILICON SOURCE GAS.

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DEPOSITING A TUNGSTEN SILICIDE (WSi_x) FILM ON THE NUCLEATION LAYER USING A (CVD) PROCESS WITH DICHLOROSILANE AS A SILICON SOURCE GAS.

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